

RECORD OF REVISION

Date	The upper section : Previous revision The lower section : New revision		Summary
	Sheet No.	Page	

DESCRIPTION

The following specifications are applied to the following IPS-TFT LCD module.

Product Name : VVX26F134H00-1

Product Factory : Panasonic Liquid Crystal Display Co., Ltd. (Japan)

General specifications

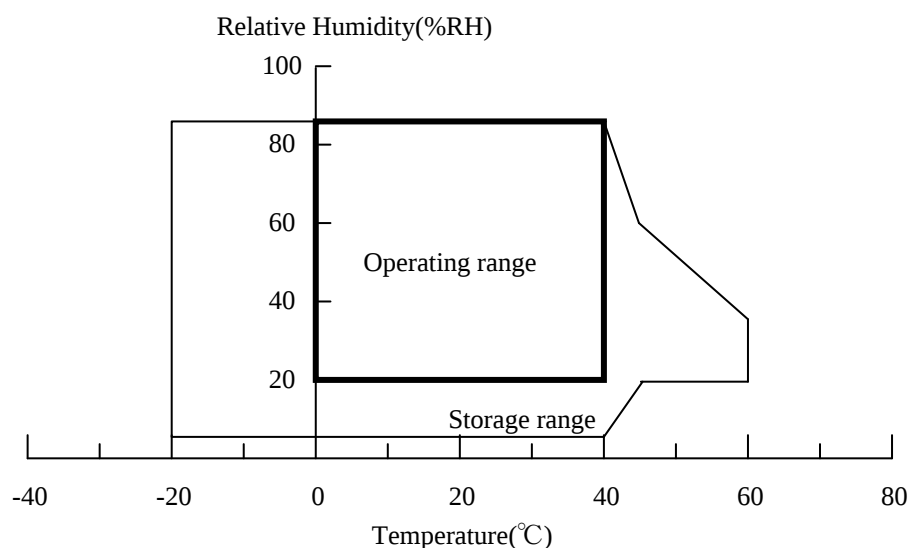
Effective display area	: (H) 576 × (V) 324	(mm)
Number of pixels	: (H) 1,920 × (V) 1,080	(pixels)
Pixel pitch	: (H) 0.300 × (V) 0.300	(mm)
Color pixel arrangement	: R+G+B vertical stripe	
Display mode	: Transmissive mode Normally black mode	
Top polarizer type	: Anti-Glare	
Number of colors	: 1,073,741,824	(colors)
Viewing angle range	: Super Wide Version (Horizontal & vertical : 178° at $\phi=0^\circ, 90^\circ, 180^\circ, 270^\circ$, CR ≥ 10)	
Input signal	: 2-channel LVDS (LVDS : Low voltage differential signaling)	
Back light	: Edge LED Type	
External dimensions	: Typ. (H) 613.0 × (V) 364.0 × (T) 21.0	(mm)
Weight	: Typ. 3,150	(g)

1. ABSOLUTE MAXIMUM RATINGS

1. 1 Environmental absolute maximum ratings

ITEM	Operating		Storage		UNIT	NOTE
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	°C	1),5)
Humidity	2)		2)		%RH	1)
Vibration	-	4.9(0.5 G)	-	9.8(1.0G)	m/s ²	3)
Shock	-	29.4(3 G)	-	196(20G)	m/s ²	4)
Corrosive gas	Not acceptable		Not acceptable		-	

- Note 1) Temperature and Humidity should be applied to the glass surface of a TFT LCD module, not to the system installed with a module.
- 2) $T_a \leq 40\text{ }^{\circ}\text{C}$ ······Relative humidity should be less than 85 %RH max. Dew is prohibited.
 $T_a > 40\text{ }^{\circ}\text{C}$ ······Relative humidity should be lower than the moisture of the 85 %RH at 40 °C.



- 3) Frequency of the vibration is between 15 Hz and 100 Hz.(Remove the resonance point)
- 4) Pulse width of the shock is 10 ms.
- 5) The temperature of LCD front surface would be 65 °C in operating, it may affect the optical characteristics however it does not damage the function of the module.

1. 2 Electrical absolute maximum ratings

(1)TFT-LCD module

V_{SS} = 0 V

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Power supply voltage	V _{DD}	0	13.2	V	
Input voltage for logic	V _I	-0.3	4.0	V	1)
Electrostatic durability	V _{ESD0}	±100		V	2),3)
	V _{ESD1}	±8		kV	2),4)

- Note
- 1) It is applied to pixel data signal and clock signal.
 - 2) Discharge coefficient : 200 pF - 250 Ω, Environmental : 25 °C - 70%RH
 - 3) It is applied to I/F connector pins.
 - 4) It is applied to the surface of a metallic bezel and a LCD panel.

(2) Back-light Driver

V_{SS} = 0 V

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Input voltage	V _{in}	0	27.0	V	
ON/OFF control input voltage	ON/OFF	-0.3	5.5	V	
PWM signal voltage	V _{pwm}	-0.3	5.5	V	

2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

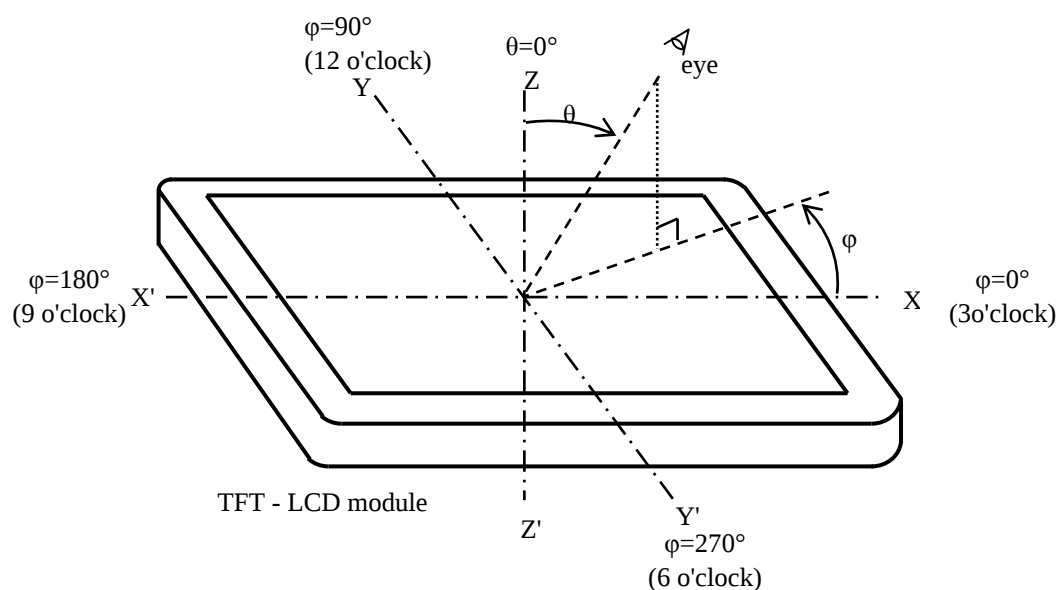
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25 °C , VDD=12.0 V , f v=60 Hz ,

Vin=24V ,PWM on duty = 90 %

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast ratio		CR	$\theta = 0^{\circ}$ 1)	800	1400	-	-	2)
Response time	Rise	ton		-	10	20	ms	3)
	Fall	toff		-	8	20	ms	3)
Brightness of white		Bwh		350	450	-	cd/m ²	
Brightness uniformity		Buni		-	-	40	%	4)
Color chromaticity (CIE)	Red	x		0.625	0.655	0.685	-	【Gray scale =1023】
		y		0.300	0.330	0.360		
	Green	x		0.275	0.305	0.335		
		y		0.585	0.615	0.645		
	Blue	x		0.120	0.150	0.180		
		y		0.030	0.060	0.090		
	White	x		0.270	0.300	0.330		
		y		0.305	0.335	0.365		
Variation of color position (CIE)	Red	Δx	$\theta = 50^{\circ}$ $\varphi = 0^{\circ}, 90^{\circ}, 180^{\circ}, 270^{\circ}$ 1)	-	-	0.04	-	5) 【Gray scale =1023】
		Δy		-	-	0.04		
	Green	Δx		-	-	0.04		
		Δy		-	-	0.04		
	Blue	Δx		-	-	0.04		
		Δy		-	-	0.04		
	White	Δx		-	-	0.04		
		Δy		-	-	0.04		
Contrast ratio at 89 °		CR89	6)	10	-	-	-	Estimated value

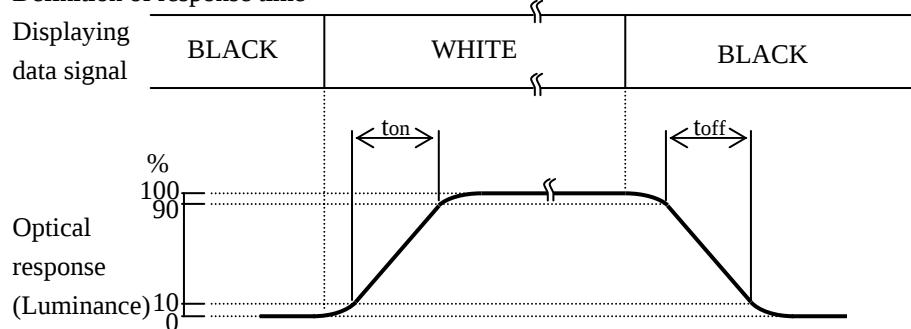
Note 1) Definition of viewing angle



Note 2) Definition of contrast ratio (CR)

$$CR = \frac{(\text{Luminance at displaying WHITE})}{(\text{Luminance at displaying BLACK})}$$

3) Definition of response time



4) Definition of brightness uniformity

Display pattern is white (1023 level). The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.

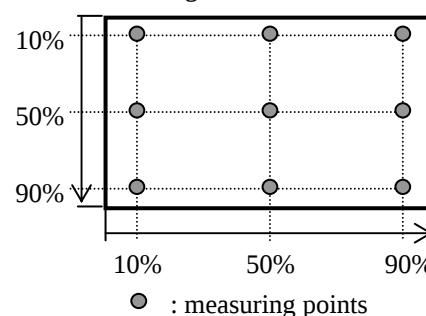
$$B_{uni} = \frac{|B_{max} \text{ or } B_{min} - B_{ave}|}{B_{ave}} \times 100$$

where, B_{max} = Maximum brightness

B_{min} = Minimum brightness

B_{ave} = Average brightness

$$B_{ave} = \frac{\sum_{k=1}^9 (B(k))}{9}$$



5) Variation of color position on CIE

Variation of color position on CIE is defined as difference between colors at $\theta = 0^\circ$ and at $\theta = 50^\circ$ & $\phi = 0^\circ, 90^\circ, 180^\circ, 270^\circ$.

6) Contrast ratio at 89°

Evaluation conditions are on horizontal & vertical axis

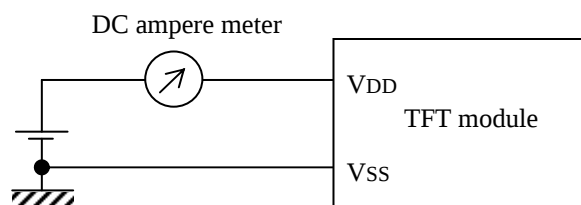
3. ELECTRICAL CHARACTERISTICS

3. 1 TFT-LCD module

Ta = 25 °C , Vss = 0 V

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Power supply voltage	VDD	11.4	12.0	12.6	V	
Power supply current	IDD	-	0.4	0.6	A	1),2)
Ripple voltage of power supply	VDDR	-	-	150	mV	
LVDS select	High	LVDSSEL	1.7	-	2.5	V
	Low		0	-	0.6	V

Note 1) fV=60.0Hz, DCLK=66MHz, VDD=12.0V, and display pattern is horizontal stripe.



- 2) Current fuse is built in a module. Current capacity of power supply for VDD should be larger than 4A, so that the fuse can be opened at the trouble of electrical circuit of module.

3. 2 Back light unit

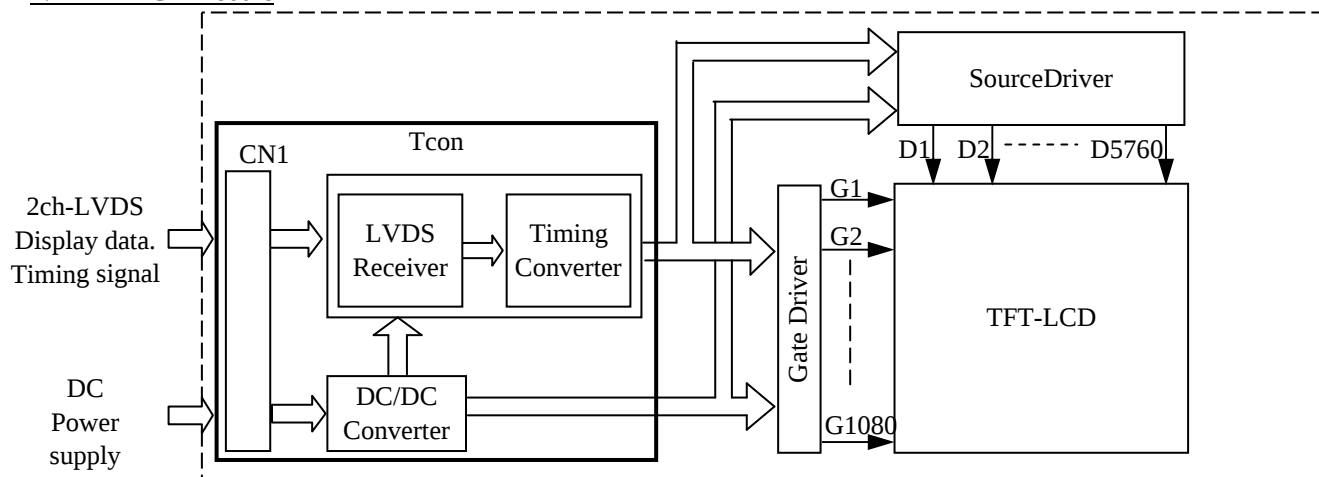
Ta = 25 °C , Vss = 0 V

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
Input voltage	Vin	21.6	24.0	26.4	V	
Input current	Iin	-	1.3	-	A	PWM on-duty=90% Vin=24V,120Hz
ON/OFF Control voltage	ON	ON/OFF	2.0	3.3	5.0	V
	OFF		-0.3	-	0.8	
PWM signal	Low	Vpwm	-0.3	-	0.8	V
	High		2.0	-	3.3	
PWM frequency	-	90	120	180	Hz	
On-duty range for burst-dimming	On-duty	10	-	90	%	
LED Life time	-	30,000	-	-	hours	2)

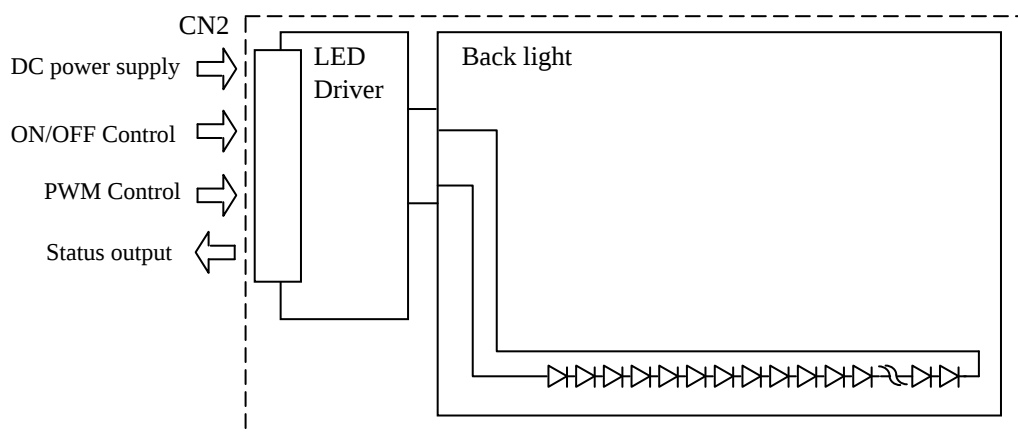
- Note 1) This characteristics should be applied putting on the LED about 60 minutes later with ambient temperature. (Ta = 25 °C ± 2 °C)
- 2) Lifetime of a LED is defined. The life is determined as the time at which brightness of the LED is 50 % compared to that of initial value at that typical LED current on condition of continuous operating at 25 ± 2 °C.

4. BLOCK DIAGRAM

4. 1 TFT-LCD module



4. 2 Back light unit



5. INTERFACE PIN ASSIGNMENT

5.1 TFT-LCD module

CN1:JAE FI-RNE51SZ-HF

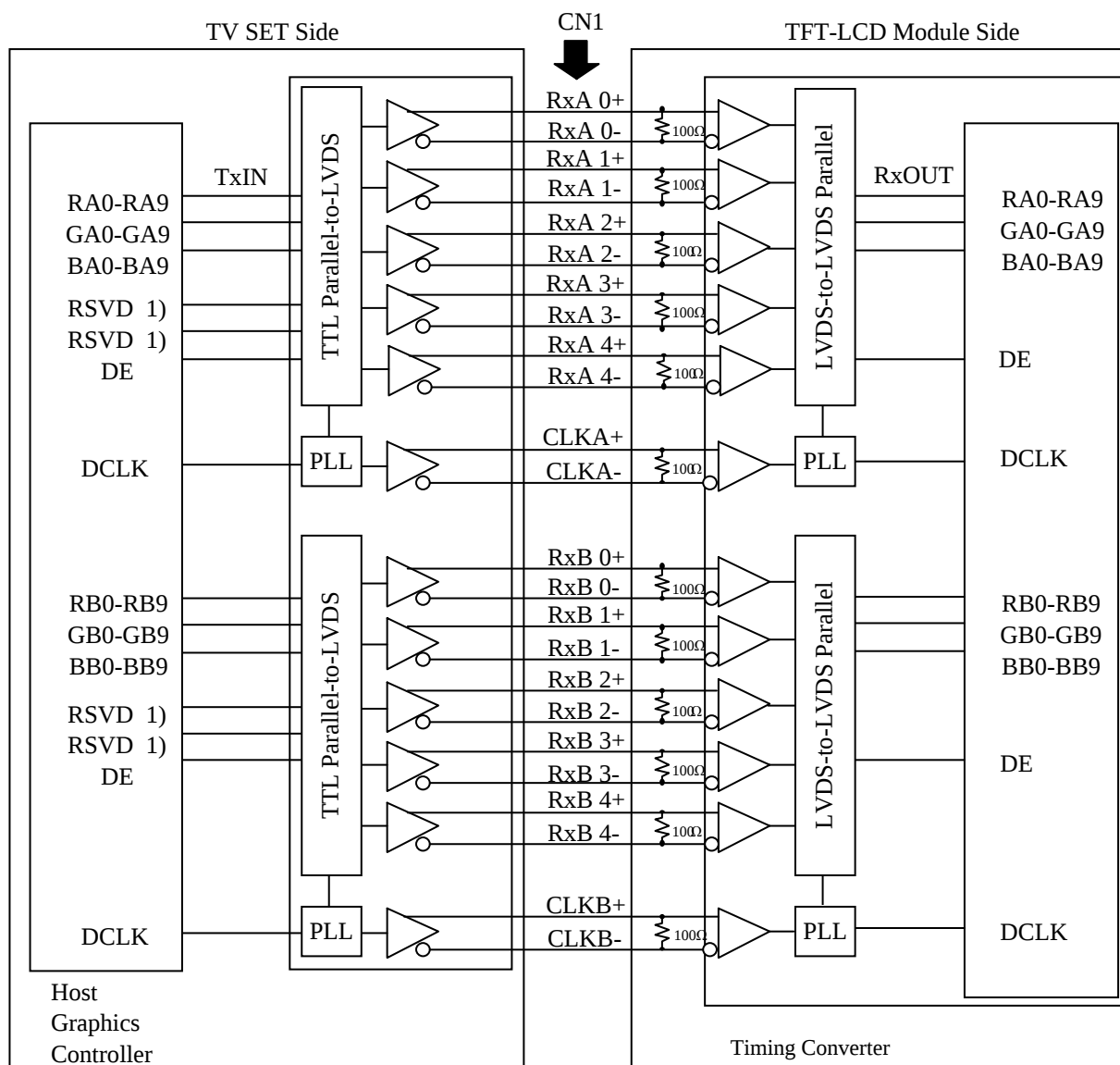
(Matching connector : JAE FI-R51-HL)

PIN No.	SYMBOL	DESCRIPTION	NOTE
1	Vss	GND(0V)	2)
2	IC	Internally Connected, Keep Open	
3	IC		
4	IC		
5	IC		
6	IC		
7	LVDSSEL	Select LVDS Data Format	4)
8	IC	Internally Connected, Keep Open	
9	NC	No Connection	
10	NC		
11	Vss	GND(0V)	2)
12	RxA0-	ODD Pixel Data	3)
13	RxA0+		
14	RxA1-	ODD Pixel Data	3)
15	RxA1+		
16	RxA2-	ODD Pixel Data	3)
17	RxA2+		
18	Vss	GND(0V)	2)
19	CLKA-	ODD Pixel Clock	3)
20	CLKA+		
21	Vss	GND(0V)	2)
22	RxA3-	ODD Pixel Data	3)
23	RxA3+		
24	RxA4-	ODD Pixel Data	3)
25	RxA4+		
26	Vss	GND(0V)	2)
27	Vss		

PIN No.	SYMBOL	DESCRIPTION	NOTE
28	RxB0-	EVEN Pixel Data	3)
29	RxB0+		
30	RxB1-	EVEN Pixel Data	3)
31	RxB1+		
32	RxB2-	EVEN Pixel Data	3)
33	RxB2+		
34	VSS	GND(0V)	2)
35	CLKB-	EVEN Pixel Clock	3)
36	CLKB+		
37	VSS	GND(0V)	2)
38	RxB3-	EVEN Pixel Data	3)
39	RxB3+		
40	RxB4-	EVEN Pixel Data	3)
41	RxB4+		
42	Vss	GND(0V)	2)
43	Vss		
44	Vss		
45	Vss		
46	Vss	No Connection	
47	NC		
48	VDD	Power Supply (typ.+12V)	1)
49	VDD		
50	VDD		
51	VDD		

- Note
- 1) All VDD pins shall be connected to +12.0V(Typ.).
 - 2) All Vss pins shall be grounded. Metal bezel is internally connected to Vss.
 - 3) Rx n+ and Rx n- (n=0,1,2,3,4) should be wired by twist-pairs or side-by-side FPC patterns, respectively.
 - 4) See page 8-3/7 & 8-4/7

5. 2 Block diagram of interface



RA0~RA9, RB0~RB9 : Pixel R Data (9; MSB, 0; LSB)
 GA0~GA9, GB0~GB9 : Pixel G Data (9; MSB, 0; LSB)
 BA0~BA9, BB0~BB9 : Pixel B Data (9; MSB, 0; LSB)
 DE : Data Enable

- Note 1) The system must have the transmitter to drive the module.
 2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5. 3 LVDS interface

The LVDSSEL signal of CN1 pin No.7 specification is "H" or open.(VESA format)

	SIGNAL	TRANSMITTER		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL
		THC63LVD1023B						
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT
30bit	RA0/RB0	76/120	TA10/TA20	TA1+/TA2+	RA1+/RA2+	67/18	RA10/RA20	RA0/RB0
	RA1/RB1	77/121	TA11/TA21			68/19	RA11/RA21	RA1/RB1
	RA2/RB2	78/122	TA12/TA22			69/20	RA12/RA22	RA2/RB2
	RA3/RB3	79/123	TA13/TA23			72/23	RA13/RA23	RA3/RB3
	RA4/RB4	80/124	TA14/TA24			73/24	RA14/RA24	RA4/RB4
	RA5/RB5	81/127	TA15/TA25	TA1-/TA2-	RA1-/RA2-	74/25	RA15/RA25	RA5/RB5
	GA0/GB0	84/128	TA16/TA26			79/33	RA16/RA26	GA0/GB0
	GA1/GB1	85/129	TB10/TB20			82/34	RB10/RB20	GA1/GB1
	GA2/GB2	86/130	TB11/TB21			83/35	RB11/RB21	GA2/GB2
	GA3/GB3	87/131	TB12/TB22	TB1+/TB2+	RB1+/RB2+	84/36	RB12/RB22	GA3/GB3
	GA4/GB4	88/132	TB13/TB23			85/37	RB13/RB23	GA4/GB4
	GA5/GB5	89/133	TB14/TB24			86/40	RB14/RB24	GA5/GB5
	BA0/BB0	90/134	TB15/TB25			93/45	RB15/RB25	BA0/BB0
	BA1/BB1	91/135	TB16/TB26			94/48	RB16/RB26	BA1/BB1
	BA2/BB2	92/136	TC10/TC20	TC1+/TC2+	RC1+/RC2+	95/49	RC10/RC20	BA2/BB2
	BA3/BB3	95/139	TC11/TC21			96/50	RC11/RC21	BA3/BB3
	BA4/BB4	96/140	TC12/TC22			99/51	RC12/RC22	BA4/BB4
	BA5/BB5	97/141	TC13/TC23			100/52	RC13/RC23	BA5/BB5
	RSVD1)	98/142	TC14/TC24			101/-	RC14/RC24	RSVD1)
	RSVD1)	99/143	TC15/TC25	TC1-/TC2-	RC1-/RC2-	102/-	RC15/RC25	RSVD1)
	DE/DE	100/144	TC16/TC26			103/-	RC16/RC26	DE/DE
	RA6/RB6	101/1	TD10/TD20			65/16	RD10/RD20	RA6/RB6
	RA7/RB7	102/2	TD11/TD21	TD1+/TD2+	RD1+/RD2+	66/17	RD11/RD21	RA7/RB7
	GA6/GB6	103/5	TD12/TD22			77/31	RD12/RD22	GA6/GB6
	GA7/GB7	106/6	TD13/TD23			78/32	RD13/RD23	GA7/GB7
	BA6/BB6	107/7	TD14/TD24			91/43	RD14/RD24	BA6/BB6
	BA7/BB7	108/8	TD15/TD25	TD1-/TD2-	RD1-/RD2-	92/44	RD15/RD25	BA7/BB7
	RSVD 1)	110/9	TD16/TD26			104/55	RD16/RD26	RSVD 1)
	RA8/RB8	111/10	TE10/TE20			63/14	RE10/RE20	RA8/RB8
	RA9/RB9	112/11	TE11/TE21	TE1+/TE2+	RE1+/RE2+	64/15	RE11/RE21	RA9/RB9
	GA8/GB8	115/12	TE12/TE22			75/26	RE12/RE22	GA8/GB8
	GA9/GB9	116/17	TE13/TE23			76/27	RE13/RE23	GA9/GB9
	BA8/BB8	117/18	TE14/TE24			87/41	RE14/RE24	BA8/BB8
	BA9/BB9	118/19	TE15/TE25	TE1-/TE2-	RE1-/RE2-	90/42	RE15/RE25	BA9/BB9
	RSVD 1)	119/20	TE16/TE26			105/56	RE16/RE26	RSVD 1)
	DCLK	15,16	CLKIN1 CLKIN2	TCLK1+/TCLK2+ TCLK1-/TCLK2-	RCLK1+/RCLK2+ RCLK1-/RCLK2-	60	CLKOUT	DCLK

RA0~RA9, RB0~RB9 : Pixel R Data (9; MSB, 0; LSB)

GA0~GA9, GB0~GB9 : Pixel G Data (9; MSB, 0; LSB)

BA0~BA9, BB0~BB9 : Pixel B Data (9; MSB, 0; LSB)

DE : Data Enable

Note 1) RSVD(reserved) pins on the transmitter shall be tied to"H"or"L".

The LVDSSEL signal of CN1 pin No.7 specification is "L".(JEIDA format)

	SIGNAL	TRANSMITTER		INTERFACE CONNECTOR		RECEIVER		TFT		
		THC63LVD1023B						CONTROL		
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT		
30bit	RA4/RB4	76/120	TA10/TA20	TA1+/TA2+	RA1+/RA2+	67/18	RA10/RA20	RA4/RB4		
	RA5/RB5	77/121	TA11/TA21			68/19	RA11/RA21	RA5/RB5		
	RA6/RB6	78/122	TA12/TA22			69/20	RA12/RA22	RA6/RB6		
	RA7/RB7	79/123	TA13/TA23			72/23	RA13/RA23	RA7/RB7		
	RA8/RB8	80/124	TA14/TA24			73/24	RA14/RA24	RA8/RB8		
	RA9/RB9	81/127	TA15/TA25	TA1-/TA2-	RA1-/RA2-	74/25	RA15/RA25	RA9/RB9		
	GA4/GB4	84/128	TA16/TA26			79/33	RA16/RA26	GA4/GB4		
	GA5/GB5	85/129	TB10/TB20			82/34	RB10/RB20	GA5/GB5		
	GA6/GB6	86/130	TB11/TB21			83/35	RB11/RB21	GA6/GB6		
	GA7/GB7	87/131	TB12/TB22			TB1+/TB2+	RB1+/RB2+	84/36	RB12/RB22	GA7/GB7
	GA8/GB8	88/132	TB13/TB23	85/37	RB13/RB23			GA8/GB8		
	GA9/GB9	89/133	TB14/TB24	86/40	RB14/RB24			GA9/GB9		
	BA4/BB4	90/134	TB15/TB25	TB1-/TB2-	RB1-/RB2-			93/45	RB15/RB25	BA4/BB4
	BA5/BB5	91/135	TB16/TB26					94/48	RB16/RB26	BA5/BB5
	BA6/BB6	92/136	TC10/TC20			95/49	RC10/RC20	BA6/BB6		
	BA7/BB7	95/139	TC11/TC21			TC1+/TC2+	RC1+/RC2+	96/50	RC11/RC21	BA7/BB7
	BA8/BB8	96/140	TC12/TC22					99/51	RC12/RC22	BA8/BB8
	BA9/BB9	97/141	TC13/TC23	100/52	RC13/RC23			BA9/BB9		
	RSVD1)	98/142	TC14/TC24	101/-	RC14/RC24			RSVD1)		
	RSVD1)	99/143	TC15/TC25	TC1-/TC2-	RC1-/RC2-			102/-	RC15/RC25	RSVD1)
	DE/DE	100/144	TC16/TC26			103/-	RC16/RC26	DE/DE		
	RA2/RB2	101/1	TD10/TD20			TD1+/TD2+	RD1+/RD2+	65/16	RD10/RD20	RA2/RB2
	RA3/RB3	102/2	TD11/TD21					66/17	RD11/RD21	RA3/RB3
	GA2/GB2	103/5	TD12/TD22					77/31	RD12/RD22	GA2/GB2
	GA3/GB3	106/6	TD13/TD23	78/32	RD13/RD23			GA3/GB3		
	BA2/BB2	107/7	TD14/TD24	TD1-/TD2-	RD1-/RD2-			91/43	RD14/RD24	BA2/BB2
	BA3/BB3	108/8	TD15/TD25			92/44	RD15/RD25	BA3/BB3		
	RSVD 1)	110/9	TD16/TD26			104/55	RD16/RD26	RSVD 1)		
	RA0/RB0	111/10	TE10/TE20			TE1+/TE2+	RE1+/RE2+	63/14	RE10/RE20	RA0/RB0
	RA1/RB1	112/11	TE11/TE21					64/15	RE11/RE21	RA1/RB1
	GA0/GB0	115/12	TE12/TE22	75/26	RE12/RE22			GA0/GB0		
	GA1/GB1	116/17	TE13/TE23	76/27	RE13/RE23			GA1/GB1		
	BA0/BB0	117/18	TE14/TE24	TE1-/TE2-	RE1-/RE2-			87/41	RE14/RE24	BA0/BB0
	BA1/BB1	118/19	TE15/TE25			90/42	RE15/RE25	BA1/BB1		
	RSVD 1)	119/20	TE16/TE26			105/56	RE16/RE26	RSVD 1)		
	DCLK	15,16	CLKIN1 CLKIN2			TCLK1+/TCLK2+ TCLK1-/TCLK2-	RCLK1+/RCLK2+ RCLK1-/RCLK2-	60	CLKOUT	DCLK

RA0~RA9, RB0~RB9 : Pixel R Data (9; MSB, 0; LSB)

GA0~GA9, GB0~GB9 : Pixel G Data (9; MSB, 0; LSB)

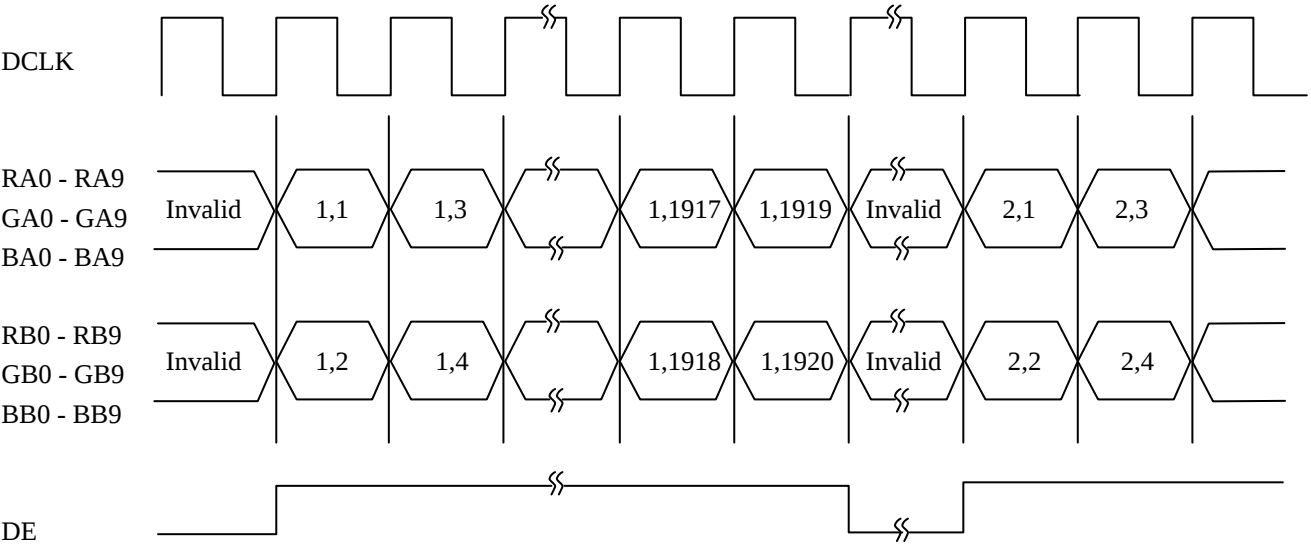
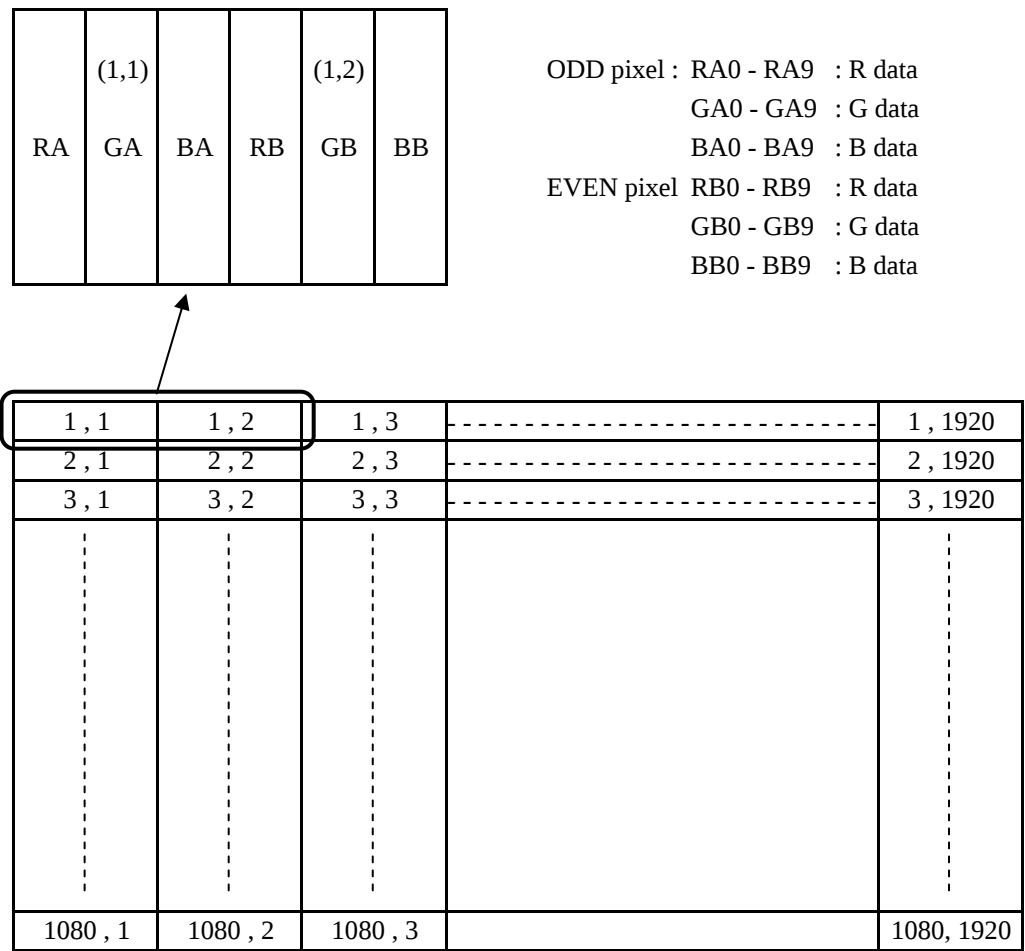
BA0~BA9, BB0~BB9 : Pixel B Data (9; MSB, 0; LSB)

DE : Data Enable

Note 1) RSVD(reserved) pins on the transmitter shall be tied to"H"or"L".

5. 4 Correspondence between input data and display image

Display data of adjacent one pixel is latched during one cycle of DCLK.



5. 5 Relationship between display colors and input signals

Input Color		Red Data										Green Data										Blue Data									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
		MSB										LSB										MSB									
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
	Blue (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

Note 1) Definition of gray scale :

Color(n) · · · · Number in parenthesis indicates gray scale level.

Larger n correspondsto brighter level.

2) Data : 1 : High, 0 : Low

5. 6 Back light unit

Inverter pin assignment

CN2:JST S14B-PHA-SM-TB(LF)(SN)

(Matching connector : JST PHR-14)

PIN No.	SYMBOL	DESCRIPTION	NOTE
1	Vin	Power supply (Typ. +24.0V)	1)
2	Vin		
3	Vin		
4	Vin		
5	Vin		
6	Vss	GND (0V)	2)
7	Vss		
8	Vss		
9	Vss		
10	Vss		
11	IC	Internally Connected, Keep Open	
12	ON/OFF	High : LED ON(3.3V) Low : LED OFF	
13	PWM	External PWM dimming	
14	FAIL	Status output (Normal:GND Abnormal:Open)	

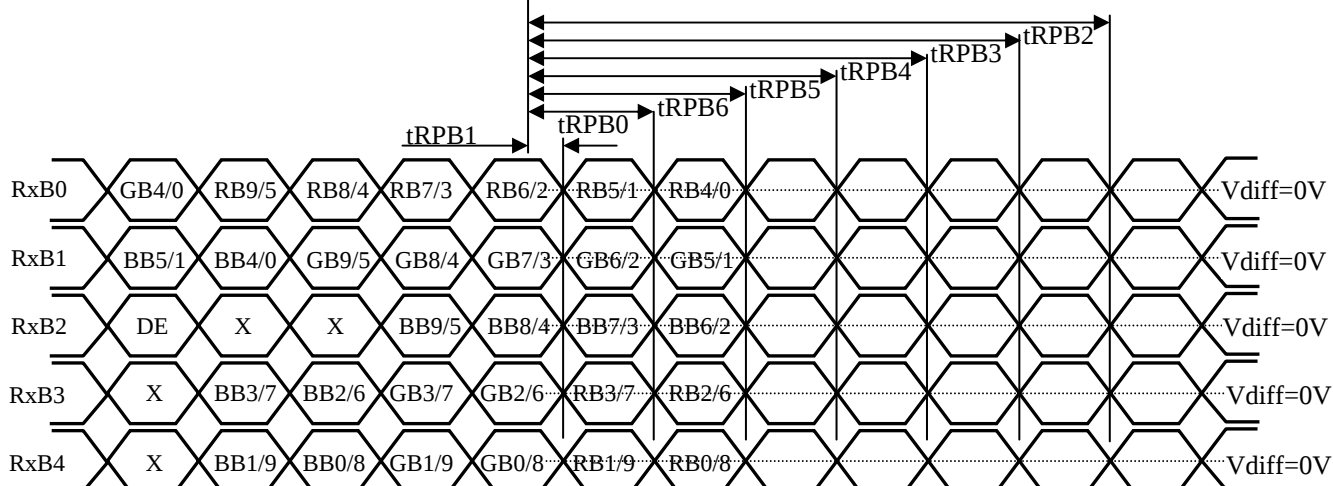
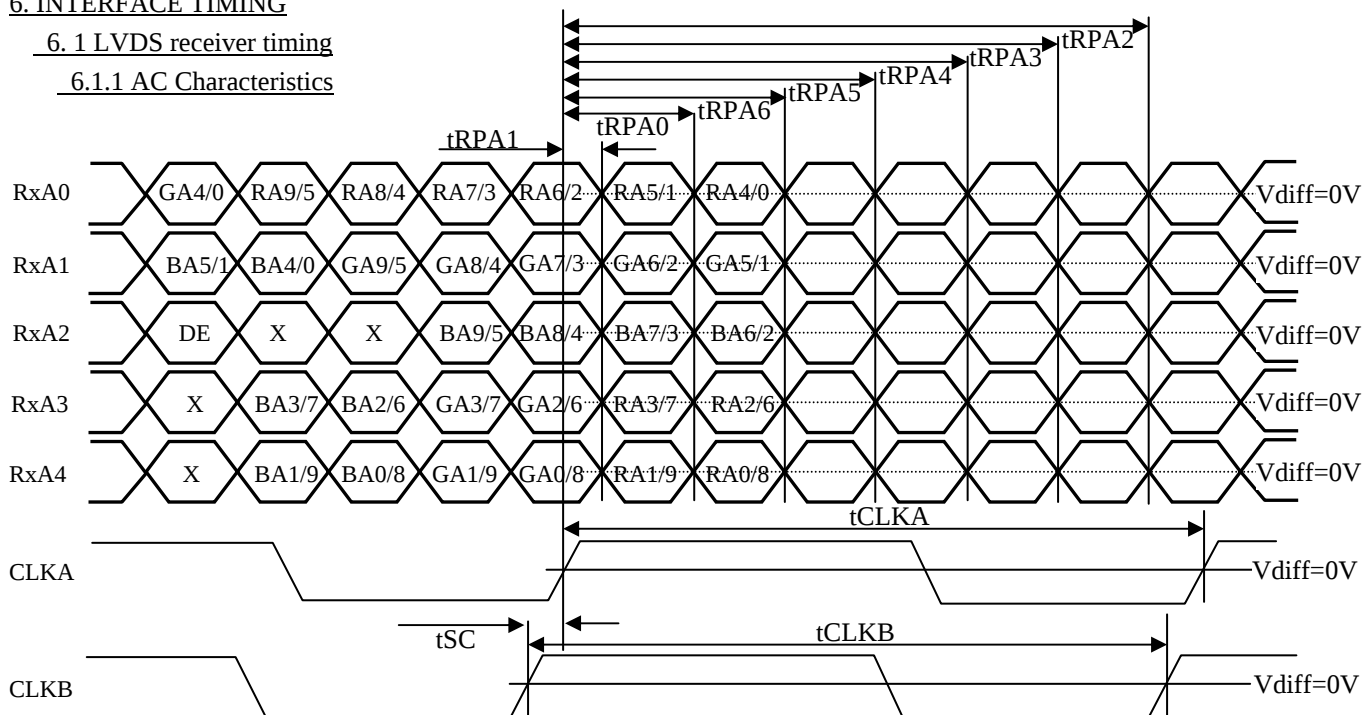
Note 1) All Vin pins shall be connected to +24.0V(Typ.).

2) All Vss pins shall be grounded. Metal bezel is internally connected to Vss.

6. INTERFACE TIMING

6.1 LVDS receiver timing

6.1.1 AC Characteristics



$$R_{x*0} = (R_{x*0+}) - (R_{x*0-})$$

$$R_{x*3} = (R_{x*3+}) - (R_{x*3-})$$

$$R_{x*1} = (R_{x*1+}) - (R_{x*1-})$$

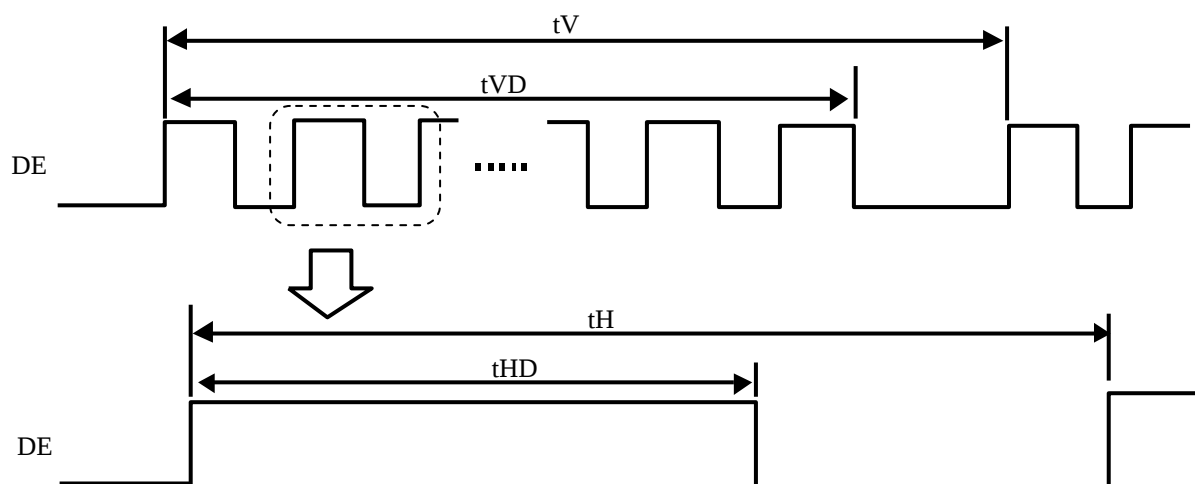
$$R_{x*4} = (R_{x*4+}) - (R_{x*4-})$$

$$R_{x*2} = (R_{x*2+}) - (R_{x*2-})$$

$$CLK = (CLK+) - (CLK-)$$

Item	Symbol	Min	Typ	Max	Unit	Note
CLK	Frequency	DCLK	64	74.25	77	MHz = 1/tCLK
	CLK Skew	tSC	- 4.0	0	+ 4.0	ns
R _{x*0} R _{x*1} R _{x*2} R _{x*3} R _{x*4}	0 data position	tRP0	1/7tCLK - 0.4	1/7tCLK	1/7tCLK + 0.4	ns
	1st data position	tRP1	- 0.4	0	+ 0.4	
	2nd data position	tRP2	6/7tCLK - 0.4	6/7tCLK	6/7tCLK + 0.4	
	3rd data position	tRP3	5/7tCLK - 0.4	5/7tCLK	5/7tCLK + 0.4	
	4th data position	tRP4	4/7tCLK - 0.4	4/7tCLK	4/7tCLK + 0.4	
	5th data position	tRP5	3/7tCLK - 0.4	3/7tCLK	3/7tCLK + 0.4	
	6th data position	tRP6	2/7tCLK - 0.4	2/7tCLK	2/7tCLK + 0.4	

6. 2 Synchronization signal timing



I)50Hz

2pxl/clock

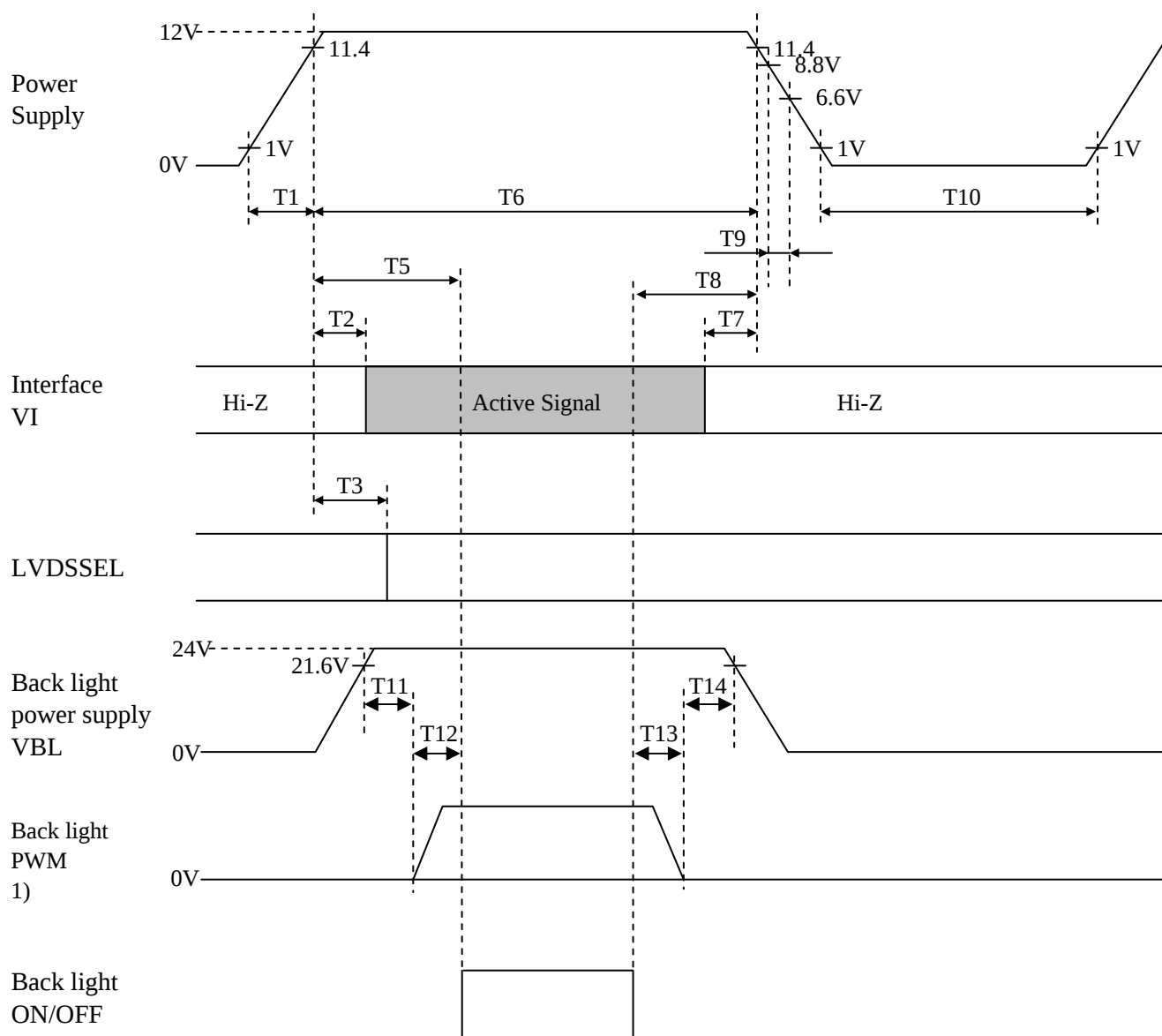
ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	47.5	50	51.85	Hz
	Vertical Period	tV	1308	1350	1380	tH
	Vertical Valid	tVD	1080			tH
	Horizontal Frequency	fH	60.9	67.5	70	kHz
	Horizontal Period	tH	990	1100	1360	tCLK
	Horizontal Valid	tHD	960			tCLK

II)60Hz

2pxl/clock

ITEM	SYMBOL	Min.	Typ.	Max.	UNIT	NOTE
DE	Vertical Frequency	fV	54.1	60	60.6	Hz
	Vertical Period	tV	1090	1125	1166	tH
	Vertical Valid	tVD	1080			tH
	Horizontal Frequency	fH	60.9	67.5	68.2	kHz
	Horizontal Period	tH	990	1100	1360	tCLK
	Horizontal Valid	tHD	960			tCLK

6.3 Timing between interface signals power supply

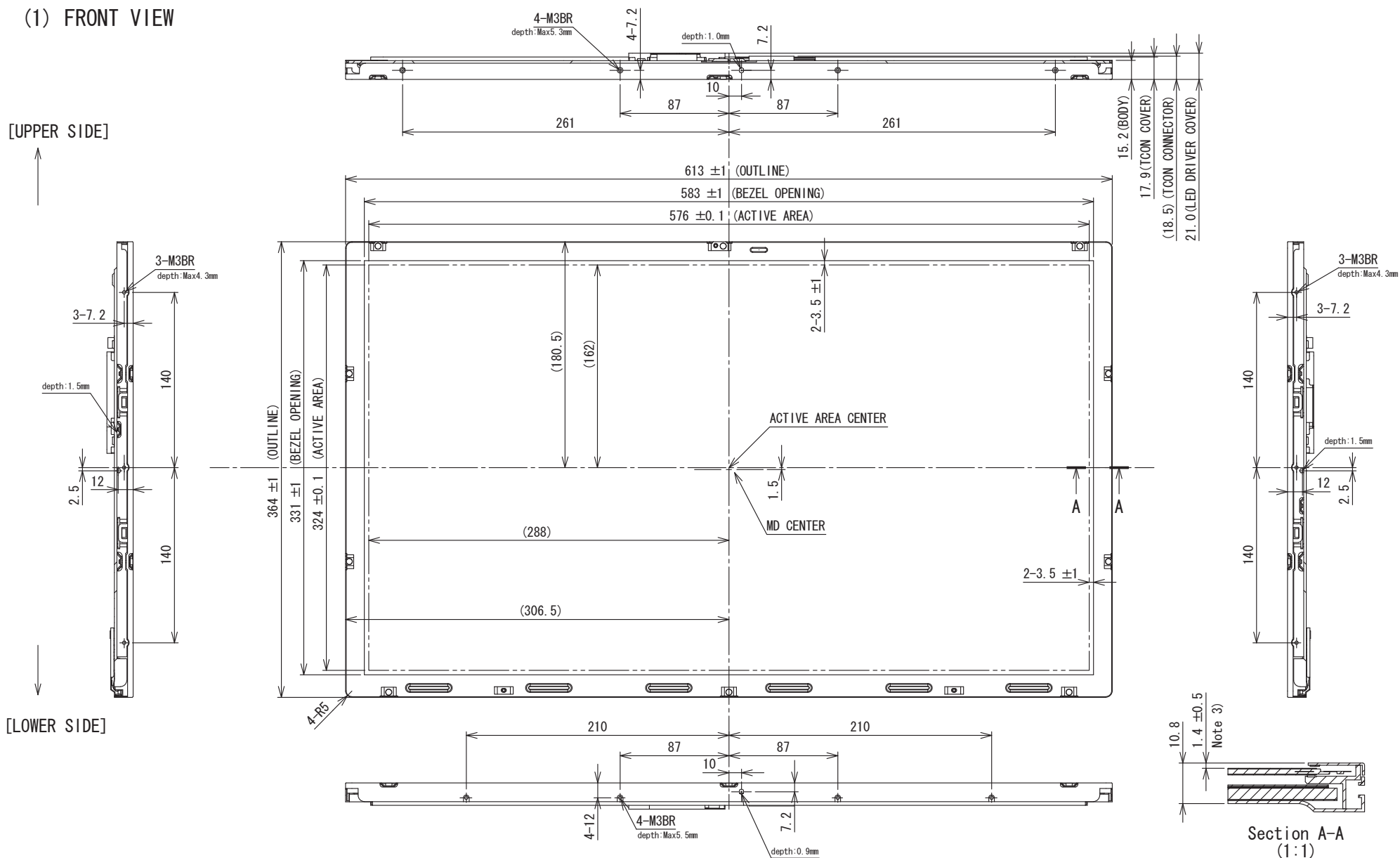


SYMBOL	Min.	Typ.	Max.	UNIT
T1	0	-	10	ms
T2	30	-	-	ms
T3	0	-	T5-150	ms
T5	500	-	-	ms
T6	500	-	-	ms
T7	0	-	-	ms
T8	0	-	-	ms
T9	20	-	-	ms
T10	2	-	-	s
T11	20	-	-	ms
T12	200	-	-	ms
T13	0	-	-	ms
T14	0	-	-	ms

Note 1) In all periods, the backlight ON/OFF signal voltage and the PWM signal voltage should be lower than the backlight power supply voltage.

7. DIMENSION OUTLINE

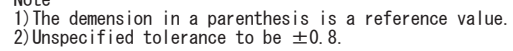
(1) FRONT VIEW



Note

- 1) The dimension in a parenthesis is a reference value.
- 2) Unspecified tolerance to be ±0.8.
- 3) The measuring method depends on Panasonic Liquid Crystal Display Co., Ltd. standard.

Note

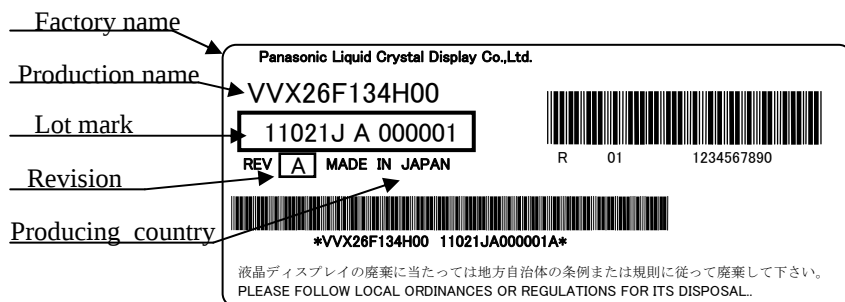


8. LABEL FORMAT

8.1 Label

The label is on the metallic bezel as shown in 7. External Dimensional.

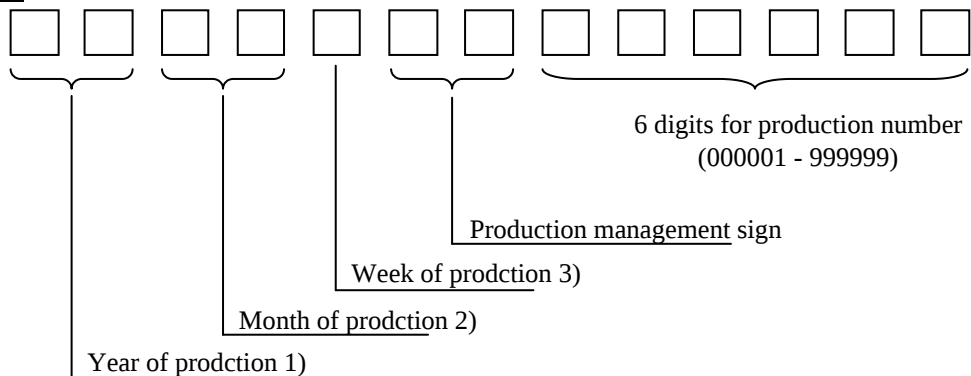
The style of character will be changed without notice.



8.2 Revision (REV.) control

REV. is the column for manufacturing convenience. A-Z except I and O may be written on this column.

8.3 Lot mark



Notes 1)

Mark	Year
11	2011
12	2012
13	2013

2)

Mark	Month	Mark	Month
01	1	07	7
02	2	08	8
03	3	09	9
04	4	10	10
05	5	11	11
06	6	12	12

3)

Week mark	Day
1	1~7
2	8~14
3	15~21
4	22~28
5	29~31

8.4 Record of revision described on the label

Rev.A=Initial

9. COSMETIC SPECIFICATIONS

9.1 Condition for cosmetic inspection

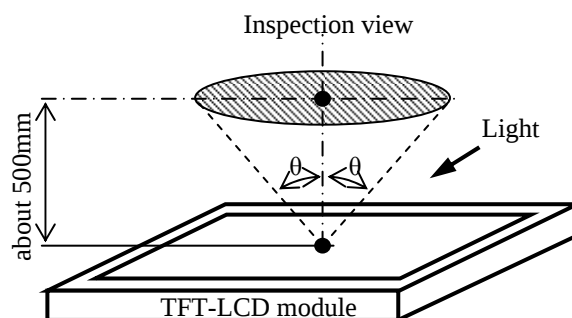
(1) Viewing zone

- a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

$\theta \leq 45^\circ$: when non-operating inspection

$\theta \leq 5^\circ$: when operating inspection

- b) Inspection should be executed only from front side and only A-zone.
Cosmetic of B-zone and C-zone are ignore.
(refer to 9.2 Definition of zone)

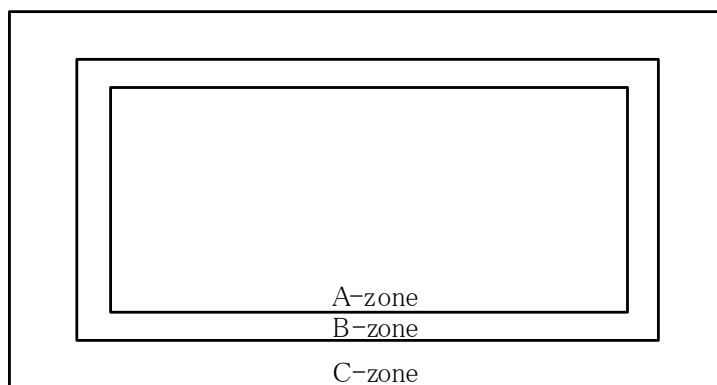


(2) Environmental

- a) Temperature : 25 degrees
b) Ambient light : about 700 lx and non-directive when operating inspection.
: about 1000 lx and non-directive when non-operating inspection.
c) Backlight : when non-operating inspection, backlight should be off .

9.2 Definition of zone

- A-zone : Display area (pixel area)
- B-zone : Area between A-zone and C-zone
- C-zone : Metallic bezel area



9.3 Cosmetic specifications

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

When displaying conditions are not stable (Only at turn on or off), the following specifications are not applied.								
	No	ITEM			Max. acceptable number		Unit	Note
					Bright defect	Low bright defect		
Operating inspection	1	Dot defect	Sparkle mode	1-dot	0	4	pcs	1),2),4)
				2-dots	0		Units	1),2),5)
				3-dots	0			
				Density	0		pcs/φ20mm	1),2),6)
				Total	4		pcs	1),2)
			Black mode	1-dot	7		pcs	1),3),4)
				2-dots	1		Units	1),3), 5),10)
				3-dots	0			
				Density	3		pcs/φ20mm	1),3),6)
				Total	7		pcs	1),3)
			Total	9		pcs	1)	
	2	Line defect			Serious one is not allowed		-	-
	3	Uneven brightness						

	No	ITEM	Max. acceptable number		Unit	Note
			Bright defect	Low bright defect		
Operating inspection	4	Stain inclusion Line shape W : width (mm) L : length (mm)	$W \leq 0.02$	L : Ignore	Ignore	pcs 7)
			$W \leq 0.04$	$L \leq 4.0$	8	
				$L > 4.0$	0	
			$W \leq 0.08$	$L \leq 2.0$	8	
				$L > 2.0$	0	
			$W > 0.08$	-	(See dot shape)	
	5	Stain inclusion Dot shape D : ave. dia (mm)	$D \leq 0.22$		Ignore	pcs 7)
			$D \leq 0.5$		8	
			$D > 0.5$		0	
	6	Scratch on polarizer Line shape W : width (mm) L : length (mm)	$W \leq 0.02$	L : Ignore	Ignore	pcs 8)
			$W \leq 0.08$	$L \leq 20$	10	
				$L > 20$	0	
			$W > 0.08$	-	0	
	7	Scratch on polarizer Dot shape D : ave. dia (mm)	$D \leq 0.2$		Ignore	pcs 8)
			$D \leq 0.6$		10	
			$D > 0.6$		0	
Non operating inspection	8	Bubbles, peeling in polarizer D : ave. dia (mm)	$D \leq 0.2$		Ignore	pcs 8)
			$D \leq 0.5$		10	
			$D > 0.5$		0	
	9	Wrinkles on polarizer		Serious one is not allowed.		- -

Note 1) Dot defect : defect area > 1/2 dot

2) Sparkle mode :

bright defect $G > 24.3\%$

$R > 24.3\%$

$B > 24.3\%$

low bright defect $24.3\% \geq G > 4.1\%$

$24.3\% \geq R > 7.8\%$

$24.3\% \geq B > 18.0\%$

3) Black mode : brightness of dot is less than 70% at white. (visible to eye)

4) 1 dot : defect dot is isolated, not attached to other defect dot.

5) N dots : N defect dots are consecutive. (N means the number of defects dots)

6) Density : number of defect dots inside $\phi 20\text{mm}$

7) Those stains which can be wiped out easily are acceptable.

8) Polarizer area inside of B-zone is not applied.

9) No major (serious) defects when viewed in gray scale mode.

10) Regarding 2-dots defect of black mode, when the pixel of the black dot is seen as the low bright dot in the other pattern (each RGB plain color, etc.) except white raster and black raster, this low bright dot shall be ignored.

10. PRECAUTION

Please pay attention to the followings when a TFT module with a back-light unit is used, handled and mounted.

10.1 Precaution to handling and mounting

- (1) Applying strong force to a part of the module may cause partial deformation of frame or mold, and cause damage to the display.
- (2) The module should gently and firmly be held by both hands. Never hold by just one hand in order to avoid any internal damage. Never drop or hit the module.
- (3) The module should be installed with mounting holes of a module.
- (4) Uneven force such as twisted stress should not be applied to a module when a module is mounted on the cover case. The cover case must have sufficient strength so that external force can not be transmitted directly to a module.
- (5) It is recommended to leave a space between a module and a holding board of a module so that partial force is not applied to a module.

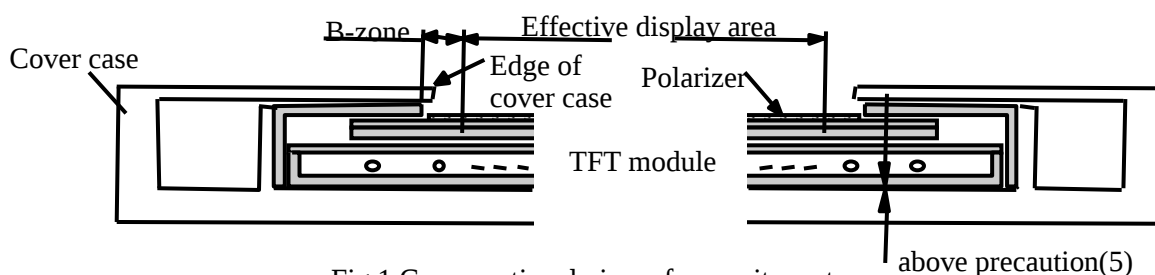


Fig.1 Cross sectional view of a monitor set

- (6) The edge of a cover case should be located inside more than 1mm from the edge of a module front frame.
- (7) A transparent protective plate should be added on the display area of a module in order to protect a polarizer and TFT cell. The transparent protective plate should have sufficient strength so that the plate can not touch a module by external force.
- (8) Materials included acetic acid and choline should not be used for a cover case as well as other parts and boards near a module. Acetic acid attacks a polarizer. Choline attacks electric circuits due to electro-chemical reaction.
- (9) The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything harder than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand, greasy clothes or dusty clothes.
- (10) The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-hexane as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a TFT cell. Other cleaning chemicals such as acetone, toluen and alcohol should not be used to clean adhesives because they cause chemical damage to a polarizer.
- (11) Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer may be deformed and its color may be faded.
- (12) The module should not be opened or modified. It may cause not to operate properly.

- (13) Metallic bezel of a module should not be handled with bare hand or dirty gloves. Otherwise, color of a metallic frame may become dirty during its storage. It is recommended to use clean soft gloves and clean finger stalls when a module is handled at incoming inspection process and production (assembly) process.
- (14) LED cables should not be pulled and held.
- (15) Please do not put outgassing substance adjacent to the polarizer film that affects the polarizer film.
(Ex. Styrene foam etc.)

10.2 Precaution to operation

- (1) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.
- (2) The spike noise causes the mis-operation of a module. The level of spike noise should be as follows:
-200mV<=over- and under- shoot of VDD<= +200mV
VDD including over- and under- shoot should be satisfied with the absolute maximum ratings.
- (3) Optical response time, luminance and chromaticity depend on the temperature of a TFT module.
- (4) Sudden temperature change may cause dew on and/or in the a module. Dew males damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.
- (5) Fixed patterns displayed on a module for a long time may cause after-image. It will be recovered soon.
- (6) A module has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.
- (7) Noise may be heard when a back-light is operated. If necessary, sufficient suppression should be done by system manufacturers.
- (8) The module should not be connected or removed while a main system works.
- (9) Inserting or pulling I/F connectors causes any trouble when power supply and signal dates are on-state. I/F connectors should be inserted and pulled after power supply and signal dates are turned off.

10.3 Electrostatic discharge control

- (1) Since a module consists of a TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a module should be grounded through adequate methods such as a list band. I/F connector pins should not be touched directly with bare hands.
- (2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic charge can be minimized.

10.4 Precaution to strong light exposure

- (1) A module should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a module may be degraded.

10.5 Precaution to storage

When modules for replacement are stored for a long time, following precautions should be taken care of:

- (1) Modules should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. Modules should be stored at 0 to 35°C at normal humidity (60%RH or less).
- (2) The surface of polarizers should not come in contact with any other object. It is recommended that modules should be stored in our shipping box.

10.6 Precaution to handling protection film

- (1) The protection film for polarizers should be peeled off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.
- (2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.
- (3) The module with protection film should be stored on the conditions explained in 10.5 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a module is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.
- (4) The adhesive can be removed easily with Normal-Hexane. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane.

10.7 Precaution to fluid

- (1) Since a module consists of a TFT cell and electronic circuits, which are very weak to fluid, keep fluid from entering between the frame and the polarizing plate.

10.8 Safety

- (1) Since a TFT cell is made of glass, handling to the broken module should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken cell should be washed sufficiently.
- (2) The module should not be taken apart during operation so that backlight drives by voltage.

10.9 Environmental protection

- (1) Flexible printed circuits and printed circuits board used in a module contain small amount of lead. Please follow local ordinance or regulations for its disposal.

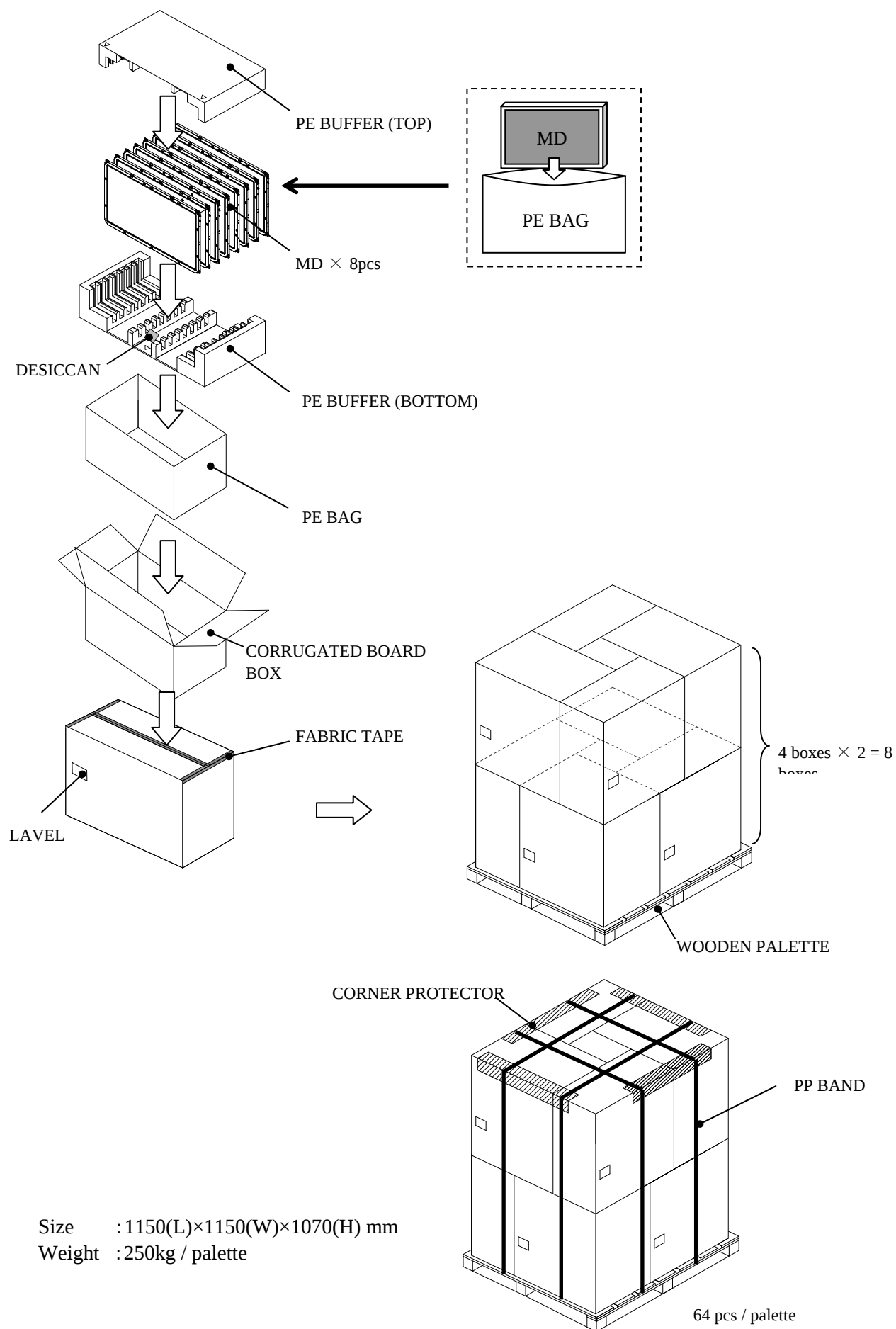
10.10 Use restrictions and limitations

- (1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.
- (2) In no event shall Panasonic Liquid Crystal Display Co., Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contract, breach of warranty, negligence, strict liability, misrepresentation and other torts.

10.11 Others

- (1) Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.

11.Packing



Size : 1150(L)×1150(W)×1070(H) mm

Weight : 250kg / palette